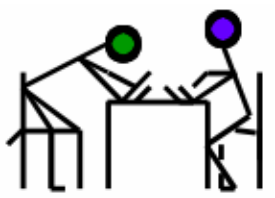
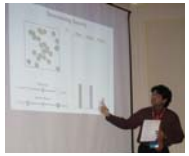




# Coordinating student learning in the collaborative classroom with interactive technologies

Jeremy Roschelle, Charles Patton, John Brecht, Chris DiGiano, Patricia Schank, *SRI International*

S. Raj Chaudhury, *Christopher Newport University,* & Deborah Tatar, *Virginia Tech*

## Abstract

While technology-based tools to support formative assessment in teacher-led classrooms have become widely available and accepted, they often have limitations in terms of the kinds of student ideas that can be represented with them. We are investigating the development of a new class of software tools based on the metaphor of a shared whiteboard and the electronic analogy of Post-it® notes.

The first of these tools, **Group Scribbles,** uses a server (TSpaces) which was designed to support the coordination of different processors and operates on a variety of client computing devices, including laptops, Tablet PCs, and PDAs. Students write their responses to a question in a private portion of their screen and then share it on an electronic whiteboard through a simple drag and drop operation. These aggregated responses then form data for the teacher and the students to reflect upon, similar to the histograms generated by classroom response systems (aka "clickers").

Faculty interested in designing collaborative learning activities that emphasize formative assessment will find this to be a rich environment for the exploration of teaching and learning issues. While the initial emphasis in our project is in the sciences, we believe the approach is applicable across multiple disciplines, just as student response systems have been adopted across the curriculum. A demonstration of the system will be available at the poster session.

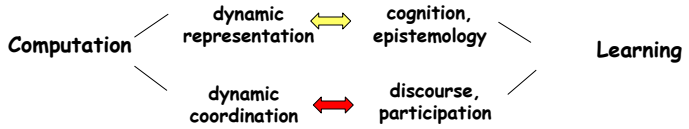
## Join the Group Scribbles Community

Download for free the software to run your own classroom server with laptops, Tablet PCs, or handheld computers.

Software is written in Java and runs on Windows, Windows Mobile, and Mac OS X.

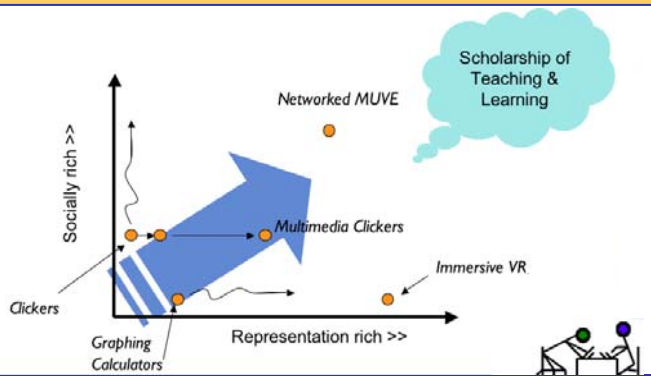
http://groupscribbles.sri.com/

## Conceptual Architecture - Beyond "Clickers"

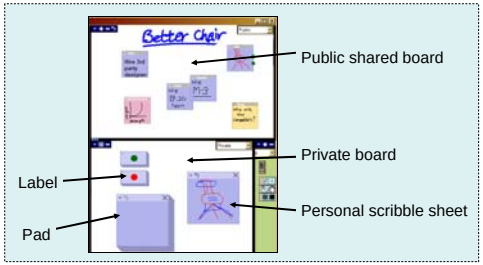


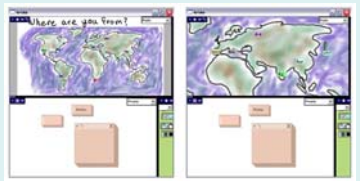

Use computation not only to support dynamic representations related to cognitive processes BUT ALSO to support the dynamic coordination of discourse and participation.

## Technology-Mediated Virtual Learning Spaces

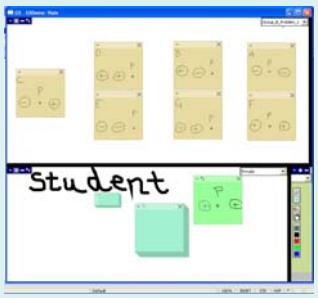



## Screenshots from Group Scribbles



ImageMap activity labels placed on graphic




*Ranking Task activity with an introductory physics class, originally devised as a pencil and paper activity and adapted to the collaborative space of Group Scribbles. The object of the activity was for students to determine the strength of the electrostatic force at the point P due to various pairs of charges. The "solution" is to arrange the sheets from left to right based on how strong the net force would be.*

## Project Goals

- Find a rigorous, general approach to classroom coordination, i.e., manage the workflow in collaborative learning activities.
- Encourage and *inspire* high-quality design of new activities and patterns.
- Provide mechanisms for data collection to support investigations in the scholarship of teaching and learning.

## CSCL Features

### Pedagogical Qualities

- *Positive interdependence and individual accountability*
  - Every student is individually accountable for some portion of the task.
  - Overall goal requires all students' contributions.
- *Role specialization*
  - Students are encouraged to focus deeply on one dimension of teamwork at a time.
- *Even-odd tolerance*
  - Applications must address the possibility that "extra" students may be assigned to a group.
- *Support for differential rates of completion*
  - Some students work faster than others and can be disruptive if they have nothing to do but wait.

### Technological Needs

- *Latecomer tolerance*
  - Late-arriving devices/users can catch up easily.
- *Robust across dropped connections*
  - Smooth activity participation is guaranteed.
- *Support disconnected mode gracefully*
  - Students work offline and submit work later.
- *Discovery paradigm*
  - Finding sessions and activities must be simple.

## Next Steps

- Continue testing to identify patterns of (1) student learning, (2) student attitudes, (3) instructor adaptation, and (4) emergence of activity design.
- Explore new client architectures and adaptability to new platforms (e.g., One Laptop per Child initiative).

## Acknowledgments

Special thanks to:
- NSF Information Technology Research Program (*Grant# 0427783*)
- Zaz Harris, Krista Davis
- David Wilder, Thomas Austin, May Hou, Lynn Lambert